

From: Terry Spragg [<mailto:spraggbag@gmail.com>]
Sent: Thursday, October 28, 2010 10:58 PM
To: Norgaard@Berkeley.edu
Cc: RMSeed6@aol.com; 'Bob Bea'; ggrayi@aol.com; Grindstaff, Joe@DeltaCouncil; Isenberg, Phil@DeltaCouncil; Kightlinger, Jeff
Subject: Professors Ray Seed, Bob Bea, and Gloria Gray information RE: Delta emergency fabric pipeline proposal

Richard Norgaard
Chairman, Delta Independent Science Board
Delta Stewardship Council
Professor of Energy & Resources Group
U.C. Berkeley
Berkeley, California

Dear Professor Norgaard,

As we briefly discussed today, I am sending you a copy of an email that Professor Ray Seed recently sent to Joe Grindstaff regarding his suggestion that an emergency fabric pipeline proposal we have submitted to the DSC be given consideration as a tool to be used following a catastrophic levee collapse after a major earthquake in the Delta. Ray's email was posted on the DSC website, as was an earlier email he wrote to the DSC on Delta emergency issues. I am also enclosing a letter of support for testing this idea from Professor Bob Bea.

You said that you knew of both Ray Seed and Bob Bea by reputation only, and that you did not know them personally. I am attaching some background information on Ray and Bob that might be of interest to you. You will note that they both oversaw the Corps of Engineers' levee repair efforts following the Katrina disaster. Ray has told me that when (not "if") a major earthquake occurs in the Delta and creates a catastrophic levee collapse, it will result in more than ten times the economic damage that was caused by the Katrina event. If you would like to discuss this emergency fabric pipeline idea, you may contact Ray by cell phone at (925) 899-6101. Bob Bea's phone number is (510) 643-8678. You may also contact either one of them at their email addresses above.

I am attaching a diagram illustrating the probability of a major earthquake in the Delta that was taken from a lengthy presentation Ray recently prepared comparing the economic and physical damage from Katrina to the anticipated damage following a catastrophic levee collapse in the Sacramento Delta. This slide indicates the amount of underground stress that has been building under the Delta levees between 1907 to 2007 compared to the number of earthquakes between 1850 and 1906.

Perhaps, if you feel it is appropriate, Ray might be available to make a presentation to the Delta Independent Science Board. You will note that I am sending Ray a copy of this email so please feel free to contact him.

Ray gave this presentation to Gloria Gray and one of her fellow Directors who sits with her on the West Basin MWD Board and on the Board of the Metropolitan Water District of Southern California Board. I hope you have a chance to ask Gloria about Ray's presentation and also about our emergency fabric pipeline proposal. You should also know that Joe Grindstaff has distributed a copy of Ray's email to all the DSC Board Members.

My primary goal in sending you this information is to ask if would be appropriate to request comments from the DISB on the proposal to test the emergency fabric pipeline idea that Ray has suggested that the DSC should consider. I am not knowledgeable as to what the investigative responsibilities are of the DISB in relationship to its responsibilities to the DSC. I am not seeking funding from either the DISB or the DSC for the implementation of a demonstration of our emergency fabric pipeline proposal, only technical opinions such as were given by Ray to Joe.

I am assuming that issues related to addressing how to respond to a catastrophic levee collapse following a major earthquake in the Delta would be an issue that your Group might consider investigating. Does the DISB make comments on the concept of placing large rocks in strategic locations in the Delta in preparation for a Delta emergency disaster? It is Ray's opinion that because of the amount of liquefaction that will occur to the Delta islands, the destruction of the levees will be such as to leave no major breaches to be filled, as many of the islands just may not exist. You might want to discuss this concept with Ray in more detail.

During our conversation I mentioned that we first came up with the idea of an emergency fabric pipeline in the Delta because of our efforts to economically transport waterbags carrying large amounts of fresh water in long trains. In the process of our waterbag technology development we designed and patented the world's strongest zipper. You can see a video of this zipper and television news coverage of two waterbags linked together using this zipper on YouTube by going to:
<http://www.youtube.com/watch?v=4TEJp6UZaDI>. Photos and other information can be seen on our website at www.waterbag.com.

We have recently designed the world's strongest waterproof zipper which we feel will have an excellent application in the development of an emergency fabric pipeline through the Delta. Following a major levee collapse we feel that because of the unique properties of our waterproof zipper connection we can create a five to seven foot diameter 40 mile long fabric pipeline through the Delta and have it installed in less than 60 days. This is just one of the issues we would like to test.

Even though several of these fabric pipelines may be able to be laid side by side on the riverbed in the Delta, our technology is not going to deliver all the water that was formerly delivered to Clifton Court for use in the State Water Project canal. But whatever volume of water our fabric pipeline might be able to deliver it would be of a significant enough volume for a number of purposes during the collapse of the fresh water delivery system in the Delta. I would be glad to send you the letter I sent to Ray Seed that describes how this fabric pipeline might be tested and implemented if you would like more information on this concept.

You will see that I am sending a copy of this email to Joe, Phil and Gloria so that tomorrow, if it is appropriate, you might be able to ask them if they would like your Group to investigate any part of our emergency fabric pipeline proposal for the Delta. I might mention that I received an email from Jeff Kightlinger, General Manager of MET, who has reviewed Ray's email to Joe and has said that he will ask the MET staff to investigate the issues raised in Ray's email and our proposal to demonstrate our emergency fabric pipeline in the Delta.

I hope you will be able to review enough of this information so that you can informally discuss it with members of the DSC and the DSC staff. I look forward to answering any questions you may have.

All the best,

Terry Spragg

Charlene Jensen

From: RMSeed6@aol.com
Sent: Monday, October 04, 2010 1:52 PM
To: joe.grindstaff@deltacouncil.ca.gov
Cc: phil.isenberg@deltacouncil.ca.gov; terry.macaulay@deltacouncil.ca.gov; eric.nichol@deltacouncil.ca.gov; elaine.martin@deltacouncil.ca.gov; Charlene Jensen
Subject: Spragg Water Conduit

Dear Joe,

We did not have time to explicitly discuss Mr. Spragg's "waterbag" technology, and so I was planning to get back to you guys this week after you have cleared through the last Council Meeting and its aftermath.

So the timing is good here.

Mr. Spragg originally proposed his waterbag technology as a potential emergency measure for transporting fresh water across a seismically damaged Delta a number of years ago. My assessment was that although it was a novel and interesting idea, it would not be very useful at the full State level as the volume of water that could be delivered via towed waterbags was too small, and as it would face likely difficulties with regard to constrictions, obstacles and potential puncture threats during transit across a badly damaged Delta.

I was struck, however, by the greater potential represented by using the same type of fabric technology to construct a modular fabric "pipeline" through the Delta. As noted in the attached E-mail from Tawnley Pranger (Chief, Response and Security Section, Division of Flood Management, DWR) there is some significant potential promise here.

DWR has been largely discouraged/disallowed from considering novel ideas that might represent either back-up plans or interim options until we achieve a seismically secure "permanent" facility as the current Administration had decided instead to bank everything on a more narrowly focussed effort to garner permission (and eventually permits) to construct such a facility. Interim plans, and emergency back-up plans, were correctly viewed as having the potential to confuse and complicate that process. In that context, Mr. Pranger's response that the idea may have merit and that it might warrant study was admirably brave and frank. It is arguably disappointing that you and the Council had not been informed of this response. And perhaps others like it.

My view is that such a singular focus on the current effort to push through a secure transmission facility was an inadvisably risky approach, given (1) the unacceptably high current stakes, (2) the unacceptable likelihood that a seismic disaster will occur before such a secure transmission facility can be put in place (which will take at least ten years, even if we begin right away.... and with a roughly 1.5% chance each year of seismic disaster in the interim), and (3) the likelihood that construction of a secure transmission facility will continue to be further delayed anyway (by political and legal obstacles and challenges, etc.). History suggests that we will continue to live with unacceptably high exposure to an unprecedented water disaster for some time to come, and as we discussed it is my view that interim and emergency back-up plans should be considered, and that promising alternatives should be pursued with all possible vigor.

We discussed examples of steps that could be usefully taken to begin to prepare for emergency post-seismic repairs in order to accelerate the rate at which water deliveries could begin to be restored. Acceleration of those repairs would reduce the State-wide economic and social calamity associated with major seismic damage to the Delta, and would also reduce the risk that environmental laws would be over-ridden by executive orders (both State and Federal) and that potentially massive long-term environmental damages would be done in order to restore water deliveries as rapidly as possible.

The types of steps that we discussed are far different from the types of steps that would be taken to

improve our ability to perform the more routine "non-seismic" finite levee breach repairs that we are well used to dealing with; and no seismically useful steps of that sort have yet been taken. Coupled with the recent restrictions on water deliveries imposed over the past two years by Judge Wanger, which have served to draw down south-of-Delta "emergency" water storage reserves (despite a couple of decades of progress in increasing such emergency storage, highlighted by the construction of the Eastside Reservoir), we are currently as vulnerable as we have ever been to potential seismic disruption (for a period of multiple years) of the Delta-centric portions of our state's water supplies. It is my understanding that Judge Wanger's recent (and stunning) partial reversal of his own rulings in this regard are not so much premised on his having had a personal epiphany upon re-reading our eloquent Blue Ribbon Panel espousal of "co-equal" values; instead, they are a result of his having had the true level of vulnerability explained to him. A potential National Security issue.

Given the current level of risk, and the high stakes, interim and emergency response enhancement alternatives should be pursued. In addition to those types of alternatives that we did have time to discuss a bit, additional alternatives should be considered as well.

The "fabric pipeline" idea has potential merit here. The cost is low; apparently on the order of \$30 to \$40 million for a 6-foot diameter pipeline running fully across the Delta from a northern Sacramento River source to the Clifton Court Forebay. That would not be the entire cost, but instead only the cost of the fabric pipeline itself. Pumps would be needed at intake and to boost transmission, and a second set of pumps (at least) would be needed in the mid-Delta to pump up to the Clifton Court location (the Clifton Court pumps cannot "draw" the water by suction; "fabric" pipelines would require positive pressures and would simply collapse under any negative pressures or "suction"). So there would be additional costs for pumps, and also for intake and outflow connectivity details.

I am not an expert on fabric pipeline hydraulics, and do not know what types of circumferential stresses the fabric pipeline could safely sustain, and so I cannot estimate how much water such a line could transmit. But it would be a great deal more than zero, and in a time of emergency (and dire need), that could be a Godsend. (The fabric tubes would be largely submerged in Delta waters, and that would serve to provide an external buttressing force, and to reduce circumferential stresses; increasing capacities.) And there is no obvious reason why we would use only one such fabric pipeline. If the system works, multiple fabric pipelines could be installed; they are a "modular" potential measure.

In the event of a seismic water catastrophe in the Delta, the costs associated with such a system will not be an issue. We will expend literally billions of dollars to rapidly expedite eventual "permanent" repairs, and we will simultaneously sustain far higher economic losses and social disruption due to lack of water deliveries until that is achieved. The economics that currently prevail under "ordinary" circumstances will not be applicable; and massive Federal resources will be brought to bear.

The fabric pipelines may be a potentially feasible emergency measure to partially mitigate the current potential for a seismically induced water disaster. Apparent advantages might include:

1. Relatively low cost.
2. The apparently environmentally benign nature of the system (as compared to massive dredging, etc., and potential semi-permanent rearrangement of channels and flow to otherwise expedite "regular" levee repairs and reconstruction.)
3. The rapidity with which the system could be deployed.
4. The modular nature of the system, so that it can be progressively expanded (additional pipelines added) over the initial months after an earthquake.
5. The system itself would appear to be rapidly repairable, and so could be maintained in a resilient manner for several years in the face of urgent levee repair and reconstruction efforts.

"Potentially feasible" is an important phrase, however. This is a novel proposal, and it would need to be studied, and field tested.

I understand that the Delta Council is not funded to undertake such development work. But the Council is empowered to recommend that interim and emergency response alternatives be considered, and that promising alternatives be advanced by means of study and proof-testing (e.g. by DWR, or others.) Also that suitable investments be made (in conjunction with development of realistic post-seismic emergency response plans) in promising/viable measures.

Given its attributes, the "fabric pipeline" idea appears to warrant inclusion among potential alternatives to be considered. The fabric pipelines themselves could apparently be rapidly fabricated and deployed, but the same may not be true with regard to pumps and intake and outfall features. If fabric pipelines were to be a potentially feasible part of our arsenal of response tools, then (1) the system would have to have been proof-tested, (2) intake and outfall preparations might have to be emplaced, and (3) working pumps might have to be acquired and tested in advance of the disaster.

Given that the current levels of risk are so high, and that the prospects for a rapid implementation of a secure long-term solution (e.g. a more "permanent" seismically secure facility) are both uncertain and remote with respect to even best-case timing; undertaking expeditious efforts to evaluate and implement "interim and emergency response enhancement" alternative should have the highest possible priority.

I hope this answers your questions. If you wish to discuss this further, I can usually best be reached either at this E-mail address, or on my cell phone at (925) 899-6101.

Best regards,

Ray Seed

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October 16, 2007

Terry Spragg
Terry G. Spragg & Associates
420 Highland Ave.
Manhattan Beach, California 90266



Dear Terry,

Thank you for sending me the DVD and documents related to your proposed waterbag ideas for developing and testing an emergency levee repair and emergency water transport system in the Delta.

I believe your ideas are valid and definitely worth testing. Only a test in actual Delta conditions will be able to validate your waterbag applications in the Delta. This should be easy and relatively inexpensive to accomplish.

During our phone conversations you referred to my comments on levee repair in the article titled, "Air-dropped dams could fix levee breaches," in the August 2007 issue of **NEW SCIENTIST ENVIRONMENT**, in which I comment on the tests being done at the U.S. Department of Homeland Security on a self-filling bladder idea originally developed by the U.S. Department of Defense. You will note my comment in this article that this bladder idea could prove useful, "*assuming the bladders can be kept securely in place.*"

The concept that you and my U.C. Berkeley colleague, Ray Seed, have proposed, which involves placing large diameter (30 to 50 feet) water filled bladders in a levee breach perpendicular to the breach so that your towing bridle secures the bladder at both ends of the bladder on each side of the breach, could solve the problem of keeping the bladders securely in place, both during filling and after they are filled.

Your waterbag/bladder technology concept could offer four important advantages to solving the levee repair problem:

- (1) Waterbags should be easy to secure in place using your patented zipper towing connection bridle at each end of the waterbag on each side of the breach.
- (2) Waterbags should be easy to fill with water once it is secured in place at both ends.
- (3) Waterbags should be easy to remove once a permanent levee repair structure is in place. Air will be forced into the secured waterbags that are filled with water, thus evacuating the water from the waterbags, and then removing the waterbags from the repaired levee breach
- (4) Waterbags should be an easy and relatively inexpensive theory to test.

I make these comments based on my experience in investigating the failures of the flood defense systems in New Orleans after the Katrina disaster, and in my capacity at the Civil & Environmental Engineering School at U.C. Berkeley (since 1988) as co-Director of the Marine Technology and Management Group and as the co-Director at the Center for Risk Mitigation.

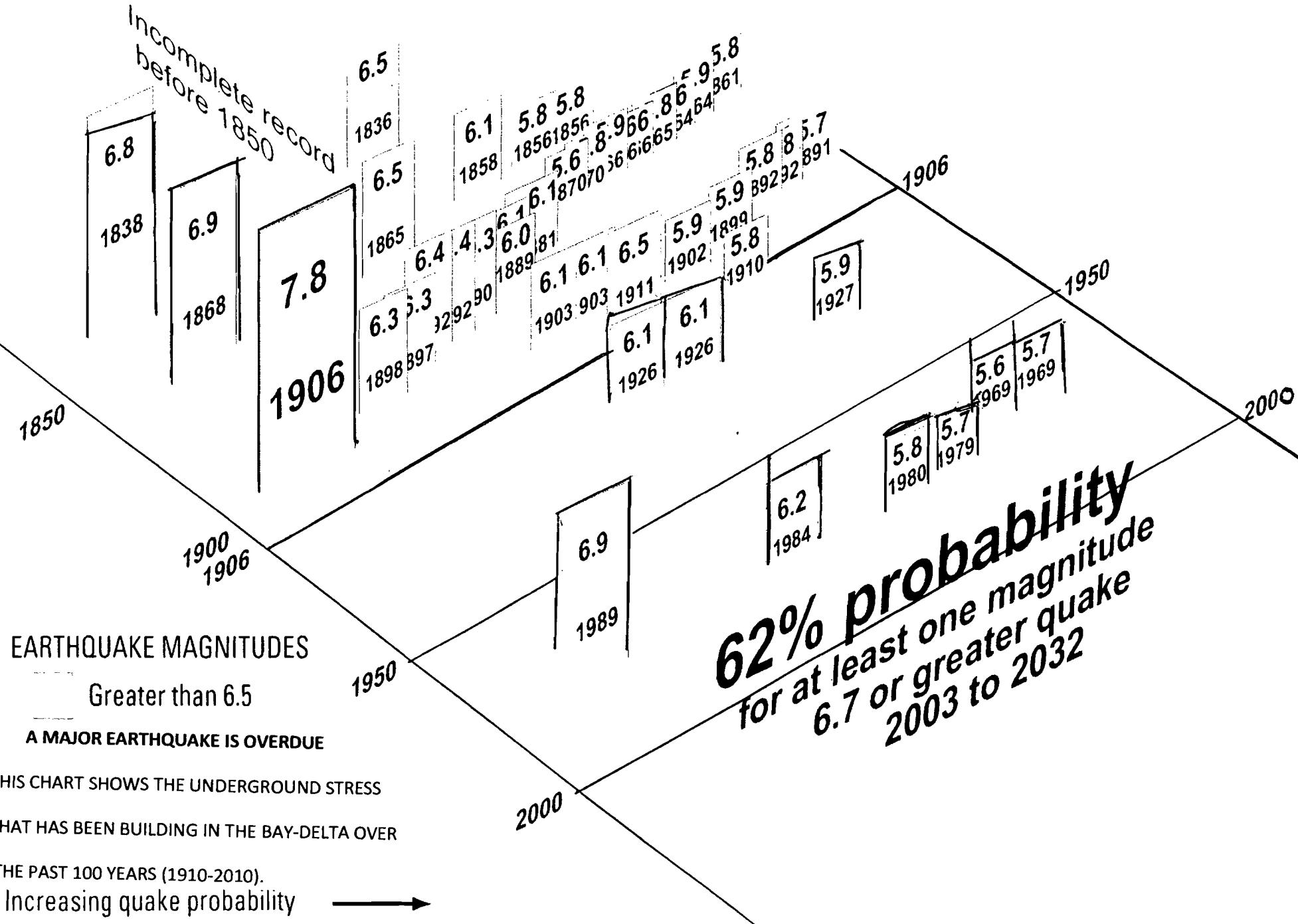
I hope that the Metropolitan Water District and/or the Department of Water Resources will consider testing the various waterbag emergency applications for the Delta you have proposed. I have read your "What if?" presentation that you plan to submit to the MWD Water Planning Committee. Your comments seem to confirm that you have presented several valid arguments for a test of your waterbag technology related to its many applications for California.

I would be happy to discuss your waterbag emergency ideas for the Delta and how a test of these ideas could be implemented with MWD/DWR officials. I can be reached by email at, Bea@ce.Berkeley.edu, or by phone at (510) 642-0967.

I wish you the best of success for your endeavors.

Best regards,

Bob Bea



From: Terry Spragg [spraggbag@gmail.com]
Sent: Wednesday, October 27, 2010 9:30 AM
To: 'Terry Spragg'
Subject: Delta Earthquake: Rare Earthquake Puzzles Experts October10 2010

Department of Water Resources

California Water News

A daily compilation for DWR personnel of significant news articles and comment

October 27, 2010

Top Items

Experts puzzle over rare quake in Sacramento-San Joaquin Delta Sacramento Bee-10/27/10

By Matt Weiser

It was a small earthquake, measuring just 3.1 on the Richter scale, but its location in the heart of the Sacramento-San Joaquin Delta has experts buzzing.

The Oct. 15 quake was centered 7 miles northwest of Lathrop, on Union Island. No faults are known to exist in that area, where earthquakes are rare.

The tremor could offer new insights on safety issues in the Delta, where concerns about flood protection and water quality during a major quake have been growing. It is also a reminder that many mysteries lurk below ground – even in California, a nucleus of earthquake research.

"It was a surprise to us," said Jack Boatwright, a geophysicist at the U.S. Geological Survey in Menlo Park who is studying the quake. "There's something down there that we don't know about."

Catie Marchini felt the quake when it struck at 4:04 a.m. She and her husband live on the western edge of Manteca, about 10 miles southeast of the epicenter.

"My husband I both woke up, because we heard the house creak and we didn't know what it was at first," said Marchini, 29. "It was kind of weird, because both my husband and I are pretty heavy sleepers."

Marchini grew up on a farm that sits on the quake's epicenter. Her parents still live there, in a house on Roberts Island, just across the river from Union Island.

They slept right through the quake.

"We live right by a levee on Middle River, but we're not too concerned about that," said her mother, Florence Drury.

She takes comfort in knowing that these levees have withstood numerous floods, as well as prior earthquakes.

Yet the risk may be greater than many Delta residents realize.

Recent studies estimate that one-third of the Delta's 70-some islands could flood in a magnitude 6.5 or greater earthquake due to levee failures. There is at least a 62 percent chance of such a quake striking the Bay-Delta region in the next 20 years, according to the geological survey.

This vulnerability is a statewide concern. Delta water diversions irrigate about 3 million acres of California farmland, and 25 million people depend on the estuary for at least some of their drinking water.

Widespread levee failures could contaminate that freshwater supply, perhaps for a year or longer.

It is not uncommon for quakes to occur where a fault has not been identified. In September 2000, for instance, a 5.0-magnitude quake struck in Napa on an unmapped fault, damaging a number of buildings.

A key difference in this case is that earthquakes of any sort are rare within the Delta. Like Sacramento, the Delta is considered seismically tame compared to the Bay Area.

About four years ago, USGS installed a network of seismic sensors in the Delta to better assess the risks. As a result, more information will be available about the Oct. 15 quake than any other in the Delta's history.

Those new sensors have already allowed another USGS geophysicist, Jon Fletcher, to draw some preliminary conclusions. He plans to publish a study later this year examining effects in the Delta from quakes that have occurred outside of it.

Fletcher found that ground motion in the Delta during a quake is as much as 10 times greater than areas outside the Delta. Basically, this means the Delta shakes more, likely because of the loose nature of the Delta's peat and sand soils. This could make its levees more vulnerable to collapse.

Most research on quake risk in the Delta has focused on the threat from faults outside the estuary, notably the Hayward fault. But the Oct. 15 quake is a reminder that the Delta has its own faults,

about which relatively little is known.

All the mapped faults in the Delta are known as "blind" faults because they don't appear on the surface – likely because its peat and sand soils are deep and relatively fluid. The largest is the Midland fault, believed to be the cause of a 3.7-magnitude quake near Rio Vista in 2002.

Ken Verosub, a geologist at UC Davis, has been studying core samples of Delta soils. He believes there is a major north-south fault beneath the Delta that has yet to be mapped.

Verosub's core samples extend only about 26 feet deep. He said more samples reaching down 300 feet are needed to understand what's really happening beneath the Delta.

"I think the seismic risk in the Delta has been underestimated, and we don't understand it," said Verosub, currently a visiting scientist at USGS in Reston, Va. "There may well be older pockets of peat buried in the Delta, and those might increase the seismic shaking."

Unlike the notorious San Andreas Fault – a strike-slip fault in which plates of the Earth's crust scrape past each other – Verosub said the fault he's studying is probably a subduction fault, in which one plate slides under another. He believes some of the eastern portion of the Delta is dropping beneath the rest of it.

This would appear to match Catie Marchini's perception of the Oct. 15 quake.

"It was a lot different than other quakes I've felt before," she said. "It wasn't like a swaying motion. It was just one hard jolt in one direction."#

<http://www.sacbee.com/2010/10/27/3135181/experts-puzzle-over-unexpected.html>

Delta water report unpopular upstream Sonora Union Democrat-10/26/10 By Sean Janssen

Local agencies dislike what they see in a report from the California Environmental Protection Agency on what is needed to improve conditions for salmon and other species in the Sacramento-San Joaquin Delta.

The report, "Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem," suggests that more water be allowed to flow from the Stanislaus, Tuolumne, Mokelumne and other rivers into the Delta, to improve conditions for salmon, smelt, shad and other fish.

But upstream users like the Tuolumne Utilities District and Calaveras County Water District think

measures called for in the non-binding report that now sits before the newly formed advisory Delta Stewardship Council threaten their water supplies.

If the measures proposed in the report are eventually adopted, reductions on local water use could be forced and “Calaveras County residents and CCWD ratepayers could potentially end up having to pay,” said Ed Pattison, CCWD’s water resources manager.

Too much of the burden of improving the Delta would rest on upstream users’ shoulders, he said.

“The beneficiaries should pay, which are largely the exporters from the Delta,” Pattison said.

The impacts of habitat restoration and predation need to be considered, not just flows, he added.

The CCWD board supports a recovery plan for the Delta that is comprehensive, Pattison said.

“It needs to be based on good science, not just on politics, which seems to be the way of water in California,” he said.

TUD General Manager Pete Kampa echoed Pattison’s sentiments.

“It’s not a report that we look favorably on and we don’t agree with the findings and recommendations,” Kampa said.

“We hope that no one uses it for any legislative or regulatory purpose because it’s not based on what we consider to be sound science.”

Environmental advocates, such as the California Water Impact Network, California Sportfishing Protection Alliance and AquAlliance, have praised calls for added flow into the Delta. They argue that increased flows can reduce contaminant concentrations and improve overall water quality.

The Modesto Irrigation District is undergoing federal re-licensing for Don Pedro dam and reservoir, operated in conjunction with the Turlock Irrigation District.

MID spokeswoman Melissa Williams emphasized the non-binding nature of the report, saying it is for information purposes only for the Bay Delta Conservation Plan.

She added, however, that the report “could be a topic of discussion” at upcoming workshops with the San Joaquin River Group Authority and the State Water Resources Control Board.#

<http://www.uniondemocrat.com/20101026101611/News/Local-News/Delta-water-report-unpopular-upstrea>

From: Saved by Windows Internet Explorer 8
Subject: Engineer Robert Bea a student of disaster - SFGate
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Engineer Robert Bea a student of disaster

SUNDAY PROFILE / Robert Bea

June 06, 2010|By David R. Baker, Chronicle Staff Writer

-

The news from the gulf worried Robert Bea.



The UC Berkeley engineering professor, fidgeting in his cluttered home office, sifted through the latest updates on a gushing undersea oil well in the Gulf of Mexico and shook his head. BP had started its "top kill" process to plug the well two days earlier, and Bea considered the prognosis grim.

"They're scared," he said. "They're doing everything they can. But what they're doing has a very low probability of success." BP abandoned the top kill the next day.

Bea's comments weren't mere armchair engineering.

A former Shell Oil executive, Bea, 73, is a student of disaster. He has spent decades investigating catastrophic engineering failures, from the New Orleans levee breaches in Hurricane Katrina to the space shuttle Columbia's fiery end.

Team studying spill

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Now he has assembled a team of researchers to delve into the April 20 explosions that destroyed the Deepwater Horizon offshore drilling rig and caused the worst oil spill in U.S. history. His group is separate from the official federal bipartisan commission begun by the White House to investigate the incident. It is also separate from the U.S. Department of Justice's criminal investigation. But Bea's study group already has interviewed eight people who were on the rig and has shared its findings with members of Congress.

"I'm an engineer - I'm in the prevention business," Bea said. "But you can't prevent what you don't understand."

Disaster is never far from his mind. He lost his home in New Orleans to Hurricane Betsy in 1965. In his office hangs a print of the Winslow Homer painting "The Fog Warning," showing a lone fisherman rowing a dinghy on dark, rising seas while a ship recedes in the distance - a classic image of dread.

Pointing finger at BP

"I keep that picture here for a reason," Bea said. "I know how that guy feels. You're looking over your shoulder and thinking, 'Oh s-, the fog's coming in, and the ship's heading in the other direction.'"

Bea's comments tend to be blunt, and he has a history of raising hackles. In a "60 Minutes" interview last month, he laid blame for the Deepwater accident squarely on BP, and he says the company appears to have ignored a study he did for it eight years ago examining problems in the business' refineries. His post-Katrina investigation into the levee failures that flooded New Orleans was sharply critical of the Army Corps of Engineers, the institution in which Bea began his career.

"He's not somebody who goes along to get along," said Kathleen Tierney, a sociology professor who heads the Natural Hazards Center at the University of Colorado at Boulder.

Dealing with disasters

Tierney is working with Bea on a study of the Sacramento-San Joaquin River Delta and said she admires and shares his approach. "It's an attitude of independence, an attitude of being willing to be very, very deeply immersed in data, an attitude of healthy skepticism, an attitude of being able to question other people's findings," she said.

A tall, lanky man who has difficulty sitting still, Bea lives with his wife, Joanie, in Moraga. He talks fast when delving into topics that fascinate him, and his comments can make sudden swerves and unexpected turns. Colleagues sometimes refer to him as a force of nature.

Bea was born into an engineering family, with a father in the Army Corps of Engineers. The younger Bea at first wanted to pursue forestry, until he realized how little the job paid.

"I realized that if I became a forester, I'd have to learn to eat pinecones," he said.

After working his way through the University of Florida, he briefly took a job with the corps. But he was assigned to the same office as his father, whom he describes as "a hard man." He soon left the corps and went back to school for a master's degree.

His next career move proved more lasting. He joined Shell Oil and stayed with the company for 16 years, in jobs that ranged from roustabout to manager of Shell's offshore technology development group.

Shell introduced him to disaster. In 1961, an offshore military radar platform southeast of New York City collapsed into the sea, killing 28 people. Shell asked Bea to study the accident and glean any lessons he could from it.

"They tasked me to look at it, because we were headed for the deep water, and we wanted to know what went wrong," he said.

Organizational errors

That grim specialty stayed with him after he left Shell, working for several years in offshore engineering consulting. It found new life after he joined the UC Berkeley faculty in 1989. There he met Karlene Roberts, a research psychologist who opened his eyes to the role that people and organizations play in catastrophes.

"We were interested in a lot of the same things, but from different perspectives," said Roberts, who now chairs the university's Center for Catastrophic Risk Management. "Look at the oil spill problem. Everyone thinks it's a technological problem. It's not. It's a management problem."

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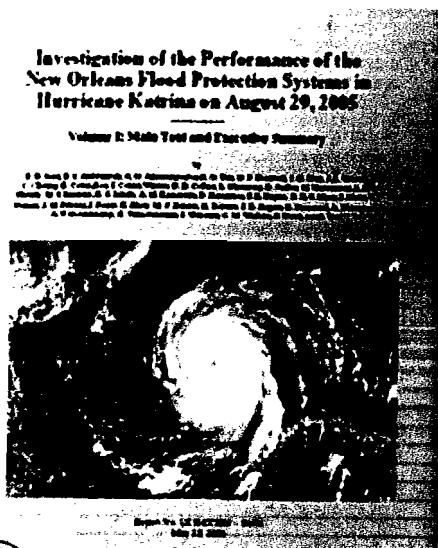
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NEWS & EVENTS

08.24.06

Professor Raymond Seed Publishes Final Report on Failure of New Orleans Levee System



Over the past nine months, a national team of 38 engineers and investigators led by Professor Raymond Seed, and sponsored by the National Science Foundation and UC Berkeley's Center for Technology Research in the Interest of Society (CITRIS), conducted an independent investigation of the failure of New Orleans' levees and flood protection system during Hurricane Katrina; the largest and most costly failure of an engineered system in history. This study represented an unprecedented effort, as the large and distinguished team of leading national experts all worked as volunteers, on a pro bono basis, in order to devote the available funding to support of students, and to cover travel, field investigation and laboratory testing expenses.

The team made a thorough study of the New Orleans regional levee system, including urgent post-hurricane forensic ground investigations, field borings and laboratory testing, and extensive computer modeling and analyses.

In its final report published on July 31, the team concluded that the several dozen levee failures in this catastrophic event occurred for a number of reasons, including the choice of materials used in the levee construction, the challenging geology and unstable soils upon which they were built, efforts to achieve economic savings at the expense of reduced margins of safety, and engineering lapses associated with failure to anticipate critical failure modes and mechanisms specific to some of the failure sites. Their research indicated that a majority of the levees failed primarily as a result of human error, and not because Hurricane Katrina was an exceptionally large hurricane.

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government and oversight agencies must coordinate their efforts to design and construct these types of complex regional systems. The report notes that the Corps' oversight of the levee system was massively hampered due to layoffs of many of its geotechnical engineers who might have otherwise more effectively overseen its design, construction and maintenance.

The UC Berkeley-led team recommends changes from the White House and Congress right on down to the local levee district level, and these include creation of a risk management council reporting directly to the President, a risk assessment office in Congress, and parallel offices at the state level. Their recommendation is not to replace the Corps of Engineers, but rather to re-establish necessary strength and support levels, and to refocus a larger fraction of its efforts on engineering rather than its current focus primarily on project management.



Professors Seed and Bea (center)
Inspecting New Orleans Levees

The report states that the principal overall lesson to be learned is that short-term savings achieved by streamlining the process of preparation for storms and other natural disasters resulted in massively larger losses when the hurricane eventually arrived; losses far out of scale with the smaller short-term savings initially achieved. This has ramifications extending well beyond the New Orleans region, and is a national issue of some urgency.

Other faculty and students from the UC Berkeley Department of Civil and Environmental Engineering who participated in this study included Profs. Jon Bray, Juan Pestana and Michael Riemer, and a very hard working group of graduate students including Rune Storesund, Adda Athanasopoulos, Diego Cobos-Roa, Xavier Vera-Grunauer, Carmen Cheung, Kofi Inkabi and Julien Cohen-Waeber.